REMARKS

Claims 1-2, 5-9, 11-25 remain within the present application. Claims 1, 5, 9, 13, 16, and 20 are amended herein. Claims 3, 4, and 10 are canceled without prejudice. Applicants respectfully request examination and allowance of Claims 1-2, 5-9, 11-25 in view of the above amendments and the arguments set forth below.

Claim objections

Paragraph one of the above referenced Office Action states that Claim 8 is objected to for informalities. Applicants have herein amended Claim 8 to correct the cited typographical error.

Claim rejections 35 U.S.C. § 102

In paragraphs 2-3 of the present Office Action, Claim 16 is rejected under 35 U.S.C. § 102(b) as being clearly anticipated by Luken Jr., U.S. Patent No. 5,278,948, (hereinafter Luken). Applicants have herein amended Claim 16 to more clearly point out aspects of the present invention. As such, Applicants respectfully submit that the present invention as recited in amended Claim 16 is not rendered unpatentable within the meaning of 35 U.S.C. § 102(b) by Luken.

Specifically, Claim 16 has been amended to include limitations regarding the use of the tri-linear interpolators within a graphics rendering pipeline to generate surface partials from a surface. Applicants respectfully submit that these limitations are not disclosed by Luken. Hence, the present invention as

recited in amended Claim 16 is not rendered unpatentable within the meaning

of 35 U.S.C. § 102(b) by Luken.

Claim rejections 35 U.S.C. § 103(b)

On page 3 of the above referenced Office Action, Claims 1-3, 6, and 8 are

rejected under 35 U.S.C. § 103(a) as being unpatentable over Jia et al., U.S.

Patent No. 5,726,896 (hereinafter Jia) in view of Gharachorloo et al., U.S.

Patent No. 5,488,684 (hereinafter Gharachorloo). Applicants have herein

amended independent Claim 1 to more particularly point out aspects of the

present invention. Accordingly, Applicants respectfully submit that the

present invention is not rendered unpatentable within the meaning of 35

U.S.C. § 103(a) by Jia and Gharachorloo references.

With respect to independent Claim 1, Claim 1 as amended recites a

computer implemented method for rendering a curve or a surface. Specifically,

Claim 1 recites in part:

> b) converting the NURBS model to a Bezier model using the
> graphics rendering pipeline;
> c) generating a plurality of Bezier control points from a
> corresponding plurality of NURBS control points using a tri-linear
> interpolator in the graphics pipeline;
> d) generating a plurality of points on a curve or surface, wherein
> the curve or surface is defined by the Bezier model, using the graphics
> rendering pipeline; and
> e) rendering the curve or surface using the plurality of points and
> using the graphics rendering pipeline.

Applicants respectfully assert that the embodiment of the present

invention recited in Claim 1 is different from the method and apparatus for

rendering trimmed parametric surfaces of Gharachorloo and the method and system for spline interpolation and their use in CNC of Jia.

As recited in amended Claim 1, the present invention is a computer implemented method for rendering a NURBS curve or a surface. The NURBS curve or surface to be rendered is received from a software program executing on the processor(s) of the computer system. The NURBS model is converted to a Bezier model. This conversion is performed using the hardware of the graphics rendering pipeline. Using this Bezier model, a plurality of points on the curve or the surface defined by the Bezier model are generated using the graphics rendering pipeline. Using these points, the curve or surface defined by the Bezier model is rendered by the hardware of the graphics rendering pipeline. This provides the advantage of much faster rendering of the curve or surface than trying to evaluate the NURBS model directly.

In contrast, Jia teaches an iterative spline interpolation method for a numerically controlled machine tool device. Applicants do not understand Jia to teach "generating a plurality of Bezier control points from a corresponding plurality of NURBS control points using a tri-linear interpolator in the graphics pipeline" as recited by Claim 1. Luken teaches the evaluation and rendering of parametric surfaces directly, in that Applicant understands Luken to teach the evaluation of NURBS surfaces directly <u>without any conversion to Bezier surfaces</u>. Additionally, Luken does not teach the use of tri-linear interpolators of the graphics rendering pipeline as recited in Claim 1. Accordingly, Applicants respectfully submit that the present invention is not rendered

unpatentable within the meaning of 35 U.S.C. § 103(a) by Jia and

Gharachorloo references.

Page 7 of the above referenced Office Action states that Claims 9-12

are rejected under 35 U.S.C. § 103(a) as being unpatentable over Luken, U.S.

Patent No 5,278,948 (hereafter Luken) in view of Jia and Sherman et al., U.S.

Patent No. 5,734,756 (hereafter Sherman). Applicants have herein amended

Claim 9 to more clearly point out aspects of the present invention. As such,

Applicants respectfully assert that the embodiment of the present invention

recited in newly amended independent Claim 9 is not rendered obvious by the

cited references within the meaning of 35 U.S.C. § 103(a).

Applicants respectfully assert that the embodiment of the present

invention recited in Claim 9 is different from the method and system for spline

interpolation and their use in CNC of Jia, the parametric surface evaluation

method and apparatus for a computer graphics display system of Luken, and

the method and apparatus of Sherman.

As in the discussion of Claim 1 above, Claim 9 includes limitations

describing a method for rendering curves or surfaces using the graphics

rendering pipeline. Additionally, Claim 9 includes limitations describing the

manner in which the Bezier curve is evaluated. Claim 9 recites limitations

describing implementing a de Casteljau process in the graphics pipeline,

evaluating a Bezier curve or surface using the de Casteljau process,

implementing the de Casteljau process using a tri-linear interpolator included

in the graphics pipeline, and rendering the Bezier curve or surface. Applicants respectfully submit that the combination of the cited references do not show or suggest the limitations of amended Claim 9. Applicants respectfully assert that the use of the tri-linear interpolators to implement the de Casteljau process as recited in Claim 9 is not inherently taught by Luken. Applicants have reviewed the cited sections of Luken (Luken col. 4, lines 40-54, col.15, lines 32-45 and do not understand them to inherently suggest or teach evaluating a Bezier curve or surface using the de Casteljau process and implementing the de Casteljau process using a tri-linear interpolator included in the graphics pipeline as recited in Claim 9. As such, Applicants respectfully assert that the present invention as recited in Claim 9 is not rendered obvious by the cited combination.

Page 9 of the above referenced Office Action states that independent Claim 13 is rendered unpatentable over Jia in view of Gharachorloo. Applicants have herein amended independent Claim 13 to more clearly point out aspects of the present invention. As such, Applicants respectfully assert that the present invention as recited in newly amended Claim 13 is not rendered obvious by the combination of Jia and Gharachorloo.

Specifically, Claim 13 includes limitations from Claim 1, additionally, Claim 13 recites additional limitations describing the method in which the NURBS surface is converted to a Bezier surface for evaluation and rendering using the tri-linear interpolators of the graphics rendering pipeline. Applicants respectfully assert that these limitations are not shown by the cited

combination. Hence, Applicants respectfully assert that the present invention as recited in newly amended Claim 13 is not rendered obvious by the combination of Jia and Gharachorloo.

With respect to independent Claim 20, page 13 of the above referenced Office Action states that Claim 20 is rejected under 35 U.S.C. § 103(a) as being rendered unpatentable over Luken in view of Gharachorloo. Applicants have herein amended independent Claim 20 to more clearly point out aspects of the present invention. Specifically, Claim 20 includes limitations of Claim 1, additionally, independent Claim 20 recites limitations describing the evaluation of the plurality of NURBS control points using tri-linear interpolation in the graphics rendering pipeline to obtain a plurality of points on a curve or surface defined by the NURBS model. Applicants respectfully assert that the present invention as recited in newly amended Claim 20 is not rendered obvious by the cited references within the meaning of 35 U.S.C. § 103(a).

With respect to the dependent claims, each dependent claim includes the limitations of its respective base claim. Accordingly, for the reasons discussed above, Applicants respectfully assert that the present invention as recited in the dependent claims is not rendered obvious within the meaning of 35 U.S.C. § 103(a).

CONCLUSION

In summary, for the reasons discussed above, Applicants respectfully submit that the Claims as amended are now in condition for allowance, and such action is earnestly solicited by Applicants.

The Examiner is urged to contact Applicants' undersigned representative if the Examiner believes such action would expedite resolution of the present Application.

Please charge any additional fees or apply any credits to our PTO deposit account number: 23-0085.

Respectfully submitted,

WAGNER, MURABITO & HAO

Dated: _23 Jun_, 1999

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